Beyond KOPIO

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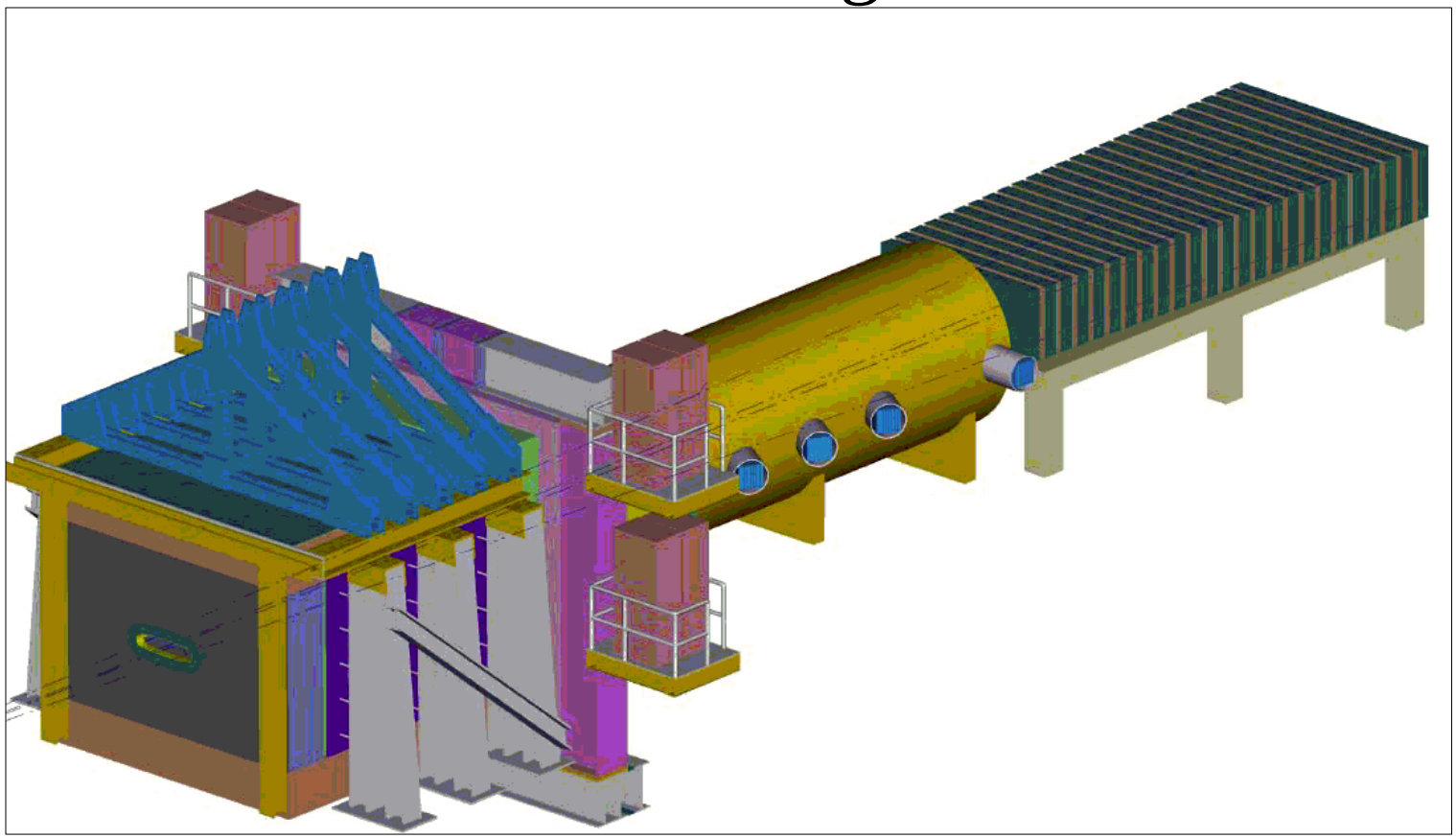


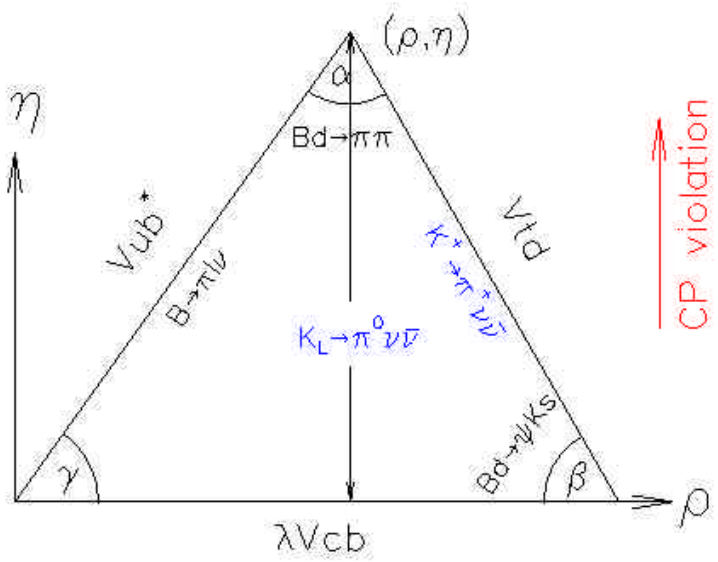
What is KOPIO ? 1

- One of two Rare Symmetry Violating Processes (RSVP experiments)
- To be run at the AGS in RHIC's "shadow"
- Funded by the NSF (MREFC project + operating)
- To start construction in 2006(5?)
- Will take 4-5 to construct
- To run for ≥5 years
- *I.e.* a 10 year project

What is KOPIO? 2

Experiment to measure $K_L \rightarrow \pi^0 \nu\bar{\nu}$

One of 4 ultra-clean processes to challenge the Standard Model explanation of CP-violation (the others are $K^+ \rightarrow \pi^+ \nu\bar{\nu}$, $B_d \rightarrow J/\psi K_S$, & x_s / x_d)



$B(K_L \rightarrow \pi^0 \nu\bar{\nu}) \propto (\text{Area of all unitarity triangles})^2$

Goal: 50 $K_L \rightarrow \pi^0 \nu\bar{\nu}$ events with 2:1 signal to bckgnd (gives 10% measurement of Jarlskog invariant)

Challenge of KOPIO

- 1 in 30,000,000,000 decay
- 2 of 3 final state particles unmeasurable
- 3^{rd} particle neutral & common
- Beam contains 3 x 10^{10} neutrons/pulse

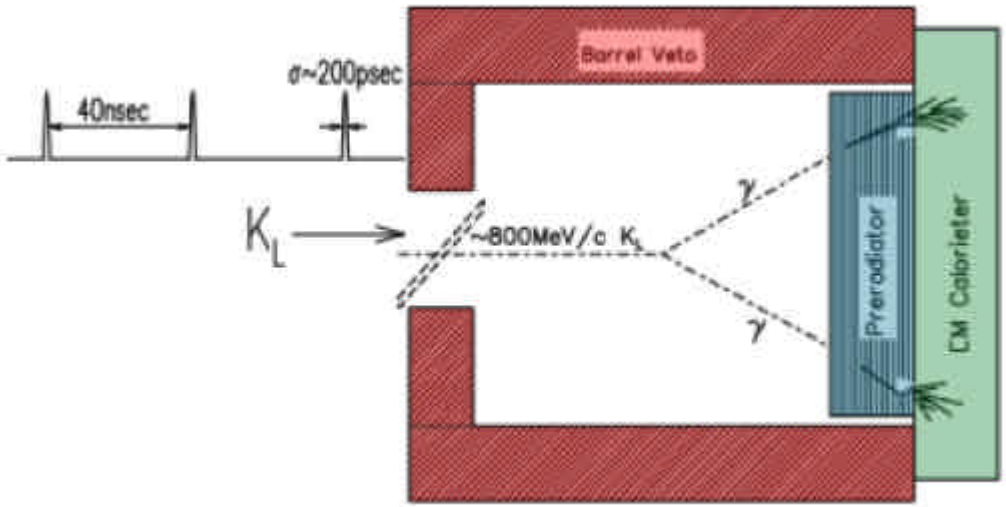
Challenge taken up by

Arizona St, BNL, Cinncinnati,IHEP-Protvino, INR-Moscow, INFN-Perugia, KEK, Kyoto U. of Education, Kyoto, Virginia Tech, New Mexico, Montreal, TJNAF, SBU, TRIUMF, UBC, Virginia, Zurich, Yale

But experiment a tall order, and more help very welcome!

How?

- Largest possible proton flux from the AGS
  - Was 70 TP, we will upgrade to get 100 TP
- Neutral beam with 10^{-4} halo
- Veto hermetically, including in beam
- Measure all possible kinematic quantities
  - K_L direction, energy, and decay vertex point
  - γ directions, energies, positions, and times

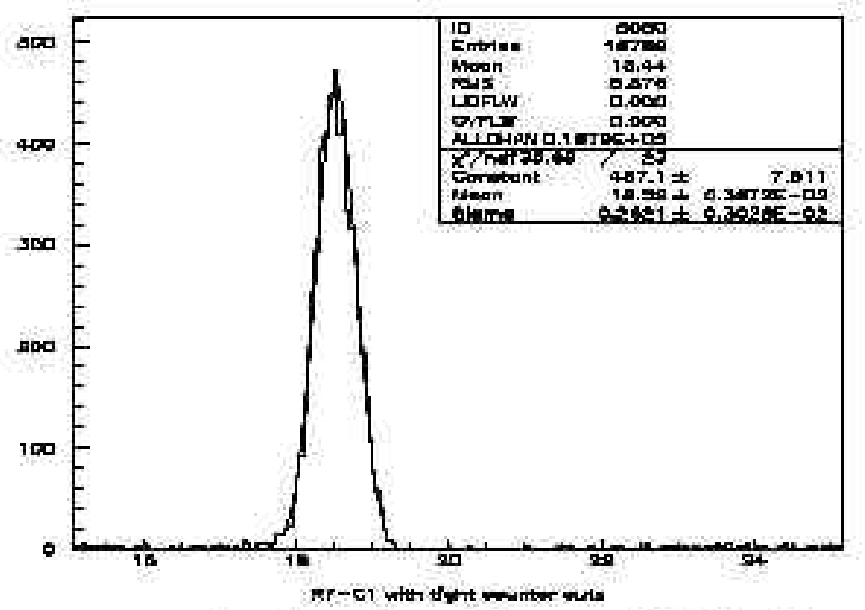


Beam Microbunching

KOPIO will use 25MHz and
A 100 MHz cavities to get 250ps bunches at 25 MHz.

One could also use latter cavity only to make still narrower bunches at 100 MHz.

Consequently – could get energy of any neutral particle:
K_L, K_S, Λ, n, nbar, …



Beyond KOPIO

- AGS at 100 TP
- Beam μ-bunching at 25 or 100 MHz (measure energy of neutral hadrons)
- Ultra-clean neutral beam
- Low energy photon directions (without impacting energy measurement)
- Shashlik E&M calorimeters with $\sigma_E/E \sim 3\%/\sqrt{E}$
- Hadron-blind electomagnetic vetoing
- Receptive funding agency!